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10/586,490	07/20/2006	Tim Jungkamp	12810-00310-US1	4571
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EXAMINER SHITERENGARTS, SAMANTHA L				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/586,490

Applicant(s)

JUNGKAMP ET AL.

Examiner

SAMANTHA SHTERENGARTS

Art Unit

4131

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/ICE)
Paper No(s)/Mail Date 21 August 2006
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-17 are currently pending in the instant application.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on July 20, 2006 was filed in compliance with the provisions of 37 CFR 1.97 and 37 CFR 1.98. The IDS was considered. A signed copy of form 1449 is enclosed herewith.

Claim Objections

3. Claim 10 is objected to because of the following informalities: It appears that the word "plug" has been omitted in line three. It appears to be a typographical error and should read, "a way to provide *plug* flow conditions." Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-17 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the nickel(0)(m-/p-tolyl phosphate) catalyst, does not reasonably provide enablement for any general catalyst. In claim 1 (dependent claims 2-3, 6-9), claim 4 (dependent claims 5, 11-12), and claim 13 (dependent claims 14-17), the instantly claimed

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process employs the use of *at least one catalyst* in the hydrocyanation process. The name of this catalyst or names of useful catalysts for the hydrocyanation process is not disclosed in the instant claims. The specification discloses the use of the nickel(0)(m-/p-tolyl phosphate) catalyst. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims.

The standard for determining whether the specification meets the enablement requirement was cast in the Supreme Court decision of *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916) which postured the question: is this experimentation needed to practice the invention undue or unreasonable? That standard is still the one to be applied. *In re Wands*, 858 F.2d 731, 737, 8USPQ2s 1400, 1404 (Fed. Cir. 1988). MPEP 2164.01(a) states "There are many factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement and whether any necessary experimentation is undue." The factors are applied below to the instant claims.

The breadth of the claims

Claims drawn to a process of hydrocyanation over at least one general *catalyst* do not enable one of ordinary skill in the pertinent art to use this process because only one specific catalyst, nickel(0)(m-/p-tolyl phosphate), is disclosed, and not claimed.

The nature of the invention

The instant claims disclose a "process of preparing 3-pentenitrile by hydrocyanating 1,3-butadiene with hydrogen cyanide over at least one catalyst." The instant specifications disclose said process with the use of a nickel(0)(m-/p-tolyl phosphate) catalyst, the only catalyst for which applicant is enabled.

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The state of the prior art/level of ordinary skill/level of predictability

The level of ordinary skill is high, but the level of predictability in the art is low. Pertinent prior art discloses the use of various zerovalent nickel complexes and their compatible ligands as catalysts in similar hydrocyanation processes. Modest structural modifications in the zerovalent nickel complex employed may or may not affect activity of catalysis in the hydrocyanation process. It would be difficult to predict activity of a catalyst of this nature. It is not known what specific structural limitations are required for the activity of any general catalyst in a hydrocyanation process. In the absence of further guidance and/or structure-activity correlation, in view of the unpredictability, one of ordinary skill would not know which modification would result in catalytic activity.

The amount of direction provided by the inventor/existence of working examples

The only catalyst that was reduced to practice is nickel(0)(m-/p-tolyl phosphate), which is not disclosed in the instant claims.

The quantity of experimentation needed to make or use the invention

It is not known which undisclosed catalyst meets the structural requirement for activity. it would require undue experimentation for one of ordinary skill to use the full scope of the general “catalyst” claimed.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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5. Claims 1-3 and 6-9 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are located in independent claim 1, and furthermore dependent claims 2-3 and 6-9. Claim 1 discloses a process for preparing 3-pentenenitrile by hydrocyanating 1,3-butadiene with hydrogen cyanide over at least one catalyst. The process comprises the following steps:

- (a) contacting 1,3-butadiene with at least one microporous solid
- (b) releasing the 1,3-butadiene from the at least one microporous solid before the hydrocyanation
- (c) regenerating the at least one microporous solid which was been contacted with 1,3-butadiene or hydrogen cyanide by heating under reduced pressure in an atmosphere comprising one or more gases selected from the group consisting of noble gases, air, and nitrogen.

The step that has been omitted is the essential step that discloses the actual hydrocyanation process. Between steps (b) and (c), a step which discloses the reaction between 1,3-butadiene with hydrogen cyanide and a catalyst is missing. Without the inclusion of this step, it is unclear as to what exactly is being regenerated since the hydrocyanation has not occurred.

6. Claims 1-3, 5, 13-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-3, 5, and 13-17 are drawn to processes which disclose vague and indefinite language. In claims 1, 5, and 13, the phrase "reduced pressure" renders the claim indefinite because it does not clearly set forth the metes and bounds of the required pressure of the claimed

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process and an ordinary skilled artisan would be unable to ascertain unambiguously what pressure was intended by the Applicants. See MPEP § 2173.05.

7. Claims 8 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 8 and 17 disclose a microporous solid with a porosity between 0 and 80% based on particle volume. Porosity is defined as the volume of water or hydrocarbon that the microporous solid may contain. The range from 0 to 80% is unclear because a porosity of zero indicates that there are no pores in the solid; however, that contradicts claims 7 and 16 that claim a pore size of at least 0.01mm, which is greater than zero. Additionally, it is unclear as to what particle volume the porosity is being based on and the phrase, "based on particle volume," renders the claim indefinite because it does not clearly set forth the metes and bounds of the required particle volume that is going to be used. Is it the particle volume of the 1,3-butadiene that is being contacted with the microporous solid, the particle volume of the hydrogen cyanide that is being contacted with the microporous solid, or the particle volume of the catalyst that is being contacted with the microporous solid? An ordinary skilled artisan would be unable to ascertain unambiguously what particle volume was intended by the Applicants. See MPEP § 2173.05.

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8. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9 discloses a microporous solid which is in extrudate form, in round form, or in undefined form as a result of fracturing. Claim 9 contains vague and indefinite language. In claim 9, the phrase “undefined form” renders the claim indefinite because it does not clearly set forth the metes and bounds of the required form of the claimed microporous solid and an ordinary skilled artisan would be unable to ascertain unambiguously what form was intended by the Applicants. See MPEP § 2173.05.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
9. Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mok (U.S. Pat # 3,846,474), and further in view of Rapoport (U.S. Pat # 4,714,773) and McGill (U.S. Pat # 4,382,038) and Fernald et al. (U.S. Pat # 6,093,285).

Determination of the scope and contents of the prior art

See Mok (section III, example 10, claims 6-7, and Example 8, line 47). Rapoport (Examples, line 20). McGill (pg 3, line 14). Fernald et al. (pg 2, lines 38-49, pg 3, lines 36-39).

Ascertaining the differences between prior art and instant claims

Instant claims 1-5 and 13-14 disclose a process for preparing 3-pentenitrile by hydrocyanating 1,3-butadiene with hydrogen cyanide over at least one catalyst comprising the following steps:

- (a) contacting 1,3-butadiene with at least one microporous solid
- (b) releasing the 1,3-butadiene from the at least one microporous solid before the hydrocyanation
- (c) regenerating the at least one microporous solid which was been contacted with 1,3-butadiene or hydrogen cyanide by heating under reduced pressure in an atmosphere comprising one or more gases selected from the group consisting of noble gases, air, and nitrogen. (Claim 1)

And further comprising:

- (d) contacting hydrogen cyanide together with or separately from the 1,3-butadiene with the at least one microporous sold. (Claim 2)

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(e) wherein said microporous solid includes tubes having beds, and the flow conditions of 1,3-butadiene are selected in such a way to provide plug flow characteristics over the at least one microporous solid. (Claim 3)

(f) A process for preparing 3-pentenitrile by hydrocyanating 1,3-butadiene with hydrogen cyanide over at least one catalyst, in the presence of at least one microporous solid. (Claim 4)

And further comprising:

(g) Regenerating the at least one microporous solid by heating under reduced pressure in an atmosphere comprising one or more gases from the group consisting of noble gases, air, and nitrogen. (Claim 5)

(h) Instant claims 13 and 14 teach the same as (a)-(c) above, with the inclusion of a step between (d) and (e) which is directing the 1,3-butadiene and the hydrogen cyanide that had contacted the at least one microporous solid to a hydrocyanation reaction system

Mok (claim 1) discloses a "process of hydrocyanating an olefinically unsaturated organic compound of the group consisting of 3-pentenitrile and 4-pentenitrile under a pressure of about 0.05 to 100 atmospheres in the presence of a catalyst consisting essentially of a zerovalent nickel complex...the improvement which comprises contacting the catalyst...with an activated crystalline metal aluminosilicate zeolite molecular sieve."

The limitation of regeneration is taught in Mok (section III, example 10), "Use of Zeolite Molecular Sieves for Reactivating Recovered or Recycled Zerovalent Nickel Hydrocyanation Catalysts," and in claims 6-7, "...the zerovalent nickel complex is contacted with the zeolite molecular sieve in the hydrocyanation medium" and "...the zerovalent nickel complex is

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withdrawn from the reaction medium and prior to its being returned to the hydrocyanation medium it is contacted with the zeolite molecular sieve." It is obvious to one of ordinary skill in the art that the purpose of the regeneration step is to remove water from the hydrocyanation reaction. Since zeolites are known to absorb water, the zeolite molecular sieve can be used as a drying agent here as well.

The limitation in which the "microporous solid includes tubes have beds" is taught in Mok (Example 8, line 47), "a quantity of catalyst solution...was passed through a Type 13X molecular sieve bed..." This prior art teaches that the molecular sieve which is employed in this process has a bed, and it is well known in the art that molecular sieves have tubes.

The difference between the instant claims and the prior art disclosed in Mok is the lack of two instantly claimed steps, the first being the reduced pressure atmosphere (claims 1 and 13) and the second being the plug-flow characteristics of 1,3-butadiene and/or hydrogen cyanide (claims 3, 10, 14). Both of these limitations are taught in the following references.

The limitation of claims 1 and 13 reads, "heating under reduced pressure in an atmosphere comprising one or more gases selected from the group consisting of noble gases, air, and nitrogen" implies the reaction can occur under reduced pressure in air, or in an inert atmosphere. Rapoport teaches that, "the reaction vessel which was fitted with a thermocouple and a pressure relief device was heated by an electric air blower, (Examples, line 20).

The limitation of claims 3, 10, and 14 reads, "the flow conditions of [1,3-butadiene or hydrogen cyanide or 1,3-butadiene and hydrogen cyanide] are selected in such a way to provide plug flow characteristics over at least one microporous solid." This limitation is taught in McGill (pg 3, line 14), "...it can be either a continuous stirred tank reactor or a plug-flow reactor or any

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combination thereof." Plug flow characteristics are defined as a flow of constant velocity in a whole system, as can be applied to 1,3-butadiene, hydrogen cyanide, or both, as claimed.

Instant claims 6, 11, and 15, disclose the process of preparing 3-pentenitrile by hydrocyanating 1,3-butadiene in which the 1,3-butadiene has a content of acetylene which is less than 1000ppm. Fernard et al. discloses (pg 2, lines 38-49), "At least one heavy impurity can be any hydrocarbon which is normally present with 1,3-butadiene in solution...the at least one heavy impurity can comprise a hydrocarbon compound selected from the group consisting of ethyl acetylene...vinyl acetylene...methyl acetylene. The concentration of impurities in the 1,3-butadiene feedstock is typically in the range of from about 100 parts per million by weight to about 1000 ppmw." On pg 3, lines 36-39, Fernard discloses, "the purified 1,3-butadiene stream comprises impurities in the range of from about 0 ppmw to about 20 ppmw...condensing and refluxing at least a portion of the overhead stream results in increased 1,3-butadiene purification efficiency." It is obvious to a person of ordinary skill in the art to prefer 1,3-butadiene with an acetylene content of less than 1000 ppm. If unpurified 1,3-butadiene generally has from 100-1000 ppm of impurity, and a microporous solid generally absorbs impurities such as acetylene, it is expected to one of ordinary skill that the 1,3-butadiene will be contain a concentration of less than 1000ppm acetylene. If not, as disclose in Fernard, there are efficient methods patented in order to purify 1,3-butadiene and removed more impurities.

Claims 7-9, 12, and 16-17 contain limitations that are obvious to one of ordinary skill in the art as being characteristics of different types of microporous solids, in particular, molecular sieves.

Claims 7 and 16 disclose a molecular sieve with a pore size from 0.01 to 20 nm. The purpose of

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pores is to trap impurities and absorb water from the compound before hydrocyanation. This large range of pore sizes would be expected by one of ordinary skill in the art because impurities come in different sizes and must be trapped in order for the hydrocyanation reaction to continue efficiently.

Resolving the level of ordinary skill in the pertinent art – Prima Facie Case of Obviousness

One of ordinary skill would be motivated, from the disclosure of Mok, to make the modifications and arrive at the instant invention with reasonable expectation of success. Each of these references: Mok, Rapoport, McGill, and Fernard et al. teach similar processes of purifying and hydrocyanating 1,3-butadiene and other olefinic compounds. It would be obvious that an ordinarily skilled artisan would be able to replicate the process in the instant application due to these obvious modifications.

Thus, the instant claims are *prima facie* obvious over the teaching of the prior art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samantha Shtrengarts whose telephone number is (571)270-5316. The examiner can normally be reached on Monday thru Thursday, 8AM – 5PM Est.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisors, Cecilia Tsang and Janet Andres can be reached on 571-27—0562 and 571-272-0867, respectively. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/SAMANTHA SHTERENGARTS/
Examiner, Art Unit 4131

/Cecilia Tsang/

Supervisory Patent Examiner, Art Unit 4131